

This lesson is part of a larger, comprehensive school garden guide called **Minnesota School Gardens: A Guide to Gardening and Plant Science** developed by Minnesota Agriculture in the Classroom in 2013. The entire guide is available at [www.mda.state.mn.us/maitc](http://www.mda.state.mn.us/maitc).



## Grade

Elementary 1-5

### Materials/Preparation

- ☐ Teacher Material A – Twig Detective – one per teacher
- ☐ Handout A – Pyramid of IPM Tactics: Red, Yellow, Green – one per student
- ☐ Handout B – Integrated Pest Management Steps – one per student
- ☐ Assessment A – Integrated Pest Management – one per student
- ☐ Twigs (approx. 12"-15" long whenever possible) – one per group of two students
- ☐ Magnifying lenses
- ☐ Computers with Internet access
- ☐ Notebooks or journals
- ☐ Writing instruments

# Learning About Integrated Pest Management

## Minnesota K-12 Academic Standards

Science	4.1.2.1	Engineers design, create and develop structures, processes and systems that are intended to improve society and may make humans more productive.
Science	4.1.3.3	The needs of any society influence the technologies that are developed and how they are used.
Science	4.3.4.1 5.3.4.1	In order to improve their existence, humans interact with and influence Earth systems.
Science	5.1.1.1	Science is a way of knowing about the natural world, is done by individuals and groups, and is characterized by empirical criteria, logical argument and skeptical review.
Science	5.4.1.1	Living things are diverse with many different characteristics that enable them to grow, reproduce and survive.
Science	1.4.3.1 2.4.3.1	Plants and animals undergo a series of orderly changes during their life cycles.
Language Arts	3.6.2.2 4.6.2.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

## Summary/Overview

In this lesson, students learn about Integrated Pest Management (IPM): the decision-making process involved in reducing pests. They will recognize that pests can be animals or insects in homes and other structures, as well as weeds, insects, and diseases in yards, gardens, and croplands.

## Garden Connection

Gardens are full of insects, some beneficial and some harmful. Integrated Pest Management is a method of controlling harmful insects.

## Background Information

Integrated Pest Management (IPM) is a way to reduce pests by using the safest and best methods to eliminate pests. IPM means being knowledgeable about the pest you are dealing with and thinking carefully about the best way to treat it. IPM is real-world science. It teaches about birds and bees, health and disease, and about the ever-shifting interface between science, nature, and culture.

Children are especially vulnerable to pesticides. They play close to the ground, put things in their mouths, grow rapidly, eat a lot relative to their body size, and are less able to detoxify chemicals in their bodies. Children in cities are at special risk because chemicals that may alter neurological



and reproductive development are most heavily applied there.

Teaching people about the link between pesticide use, IPM, and water quality is crucially important. Public concern about health and environmental risks, especially for children, is increasing. IPM is endorsed by the EPA and national parent-teacher groups. The National Institute of Occupational Safety and Health recommends IPM for schools. We can teach our citizens to prevent or reduce pest infestations using a combination of good science and good sense; to choose the least toxic agents when pesticides are necessary as a last resort; to base pest control decisions on identifying pests correctly and understanding their biology; and to think IPM.

## Objectives

- Define integrated pest management.
- Explain the IPM pyramid.
- Describe the difference between a harmful and beneficial pest.

## Procedure

### Interest Approach

Observing plants is critical to determine whether they are infested with insects or plagued by a disease. This activity allows students to practice their observation skills as they look at tree twigs.

Distribute a twig (approx. 12"-15" long whenever possible) for each pair of students to examine in the classroom. As an alternative, you may choose to have students go outside to investigate twigs as they grow on the tree. Review information about parts of a twig and determining twig growth on Teacher Material A.



### Procedure:

- Students use a magnifying glass to find pith, leaf scar, bud, and terminal bud ring.
- Trace back the years by measuring the distance from one terminal bud ring to the next.
- What conclusions can be made about growth? About the health of the tree?
- Discuss possible reasons for these growth patterns.
- Have any of the twigs been affected by pests? What evidence did the students find? How did it affect growth?

## Summary of Content and Teaching Strategies

IPM is the short way to say Integrated Pest Management, which means being careful about how we try to reduce pests. The word "integrated" means using a combination of ways to do something.

### Pesky Pests

Ask students what a pest is. What are some examples? Explain a pest is what we call things, usually living things, that are causing problems. Sometimes this means bugs are eating our plants. Sometimes it means a disease is affecting our fruit trees. Weeds can be pests in gardens because they compete for nutrients and water in the soil.

Something that is a pest in our house, like ants, may not be pests outside. Sometimes, a pest is something that is simply in the wrong place. A wasp can be a pest when it is next to your front door. But in the garden, it is a beneficial insect because it eats caterpillars that eat your vegetables.

Provide students with Handout A. Read through the pyramid of IPM tactics as a class and have students fill in the blanks. An example of applying the pyramid of IPM tactics in a home would be to reduce the number of houseflies. The green area includes sanitation techniques (ex: keep garbage sealed) and physical techniques (ex: exclude flies by replacing broken screens). The yellow area is use caution (ex: flypaper). Finally, the red area is last resort (ex: pyrethrins insecticide).

Next give students copies of Handout B and review the steps of IPM in groups. The IPM steps are quite involved requiring identification, research into life cycle, sampling, determining a threshold, choosing tactics, and evaluating. Each step is a critical component to keep pests at bay.



If weather permits, take students outside to observe plants on the school grounds and complete step one of IPM. Look at garden plants, trees, or shrubs. While observing a plant, have students look for signs of pests. The signs might be holes in leaves, scars down the stems of plants, spots on the leaves of wilting plants, etc. The pest might not be obvious or present. Have students document signs of problems and pests in a notebook or journal. Log the date, time, and location of the plant as well as a description and drawing or photo of the problem and/or pest.

Back in the classroom, instruct students to research the pests they found using the Internet. During their research, students should determine if the pest is harmful, the pest's lifecycle, and non-chemical ways of eliminating the pest. Share findings shared with the class. Examples of insects found in a garden include blister beetle, cabbage looper, earwig, lacewing larva, paper wasps, and sowbugs. An excellent resource is the University of Minnesota Extension's resource called "What insect is this?" [www.extension.umn.edu/gardeninfo/insectgallery/garden/index.html](http://www.extension.umn.edu/gardeninfo/insectgallery/garden/index.html).

If weather does not allow students to observe plants outside, have them research to determine common garden pests. Each student selects a pest to learn more about. They find out how the pest is harmful, pest lifecycle, and non-chemical ways of eliminating the pest. Share findings with the class.

## Review/Summary

Have students create posters advertising the benefits of IPM and explaining the six steps. Or, have them develop a solution to a specific pest problem that does not use pesticides and would fit in the green area of the IPM model.

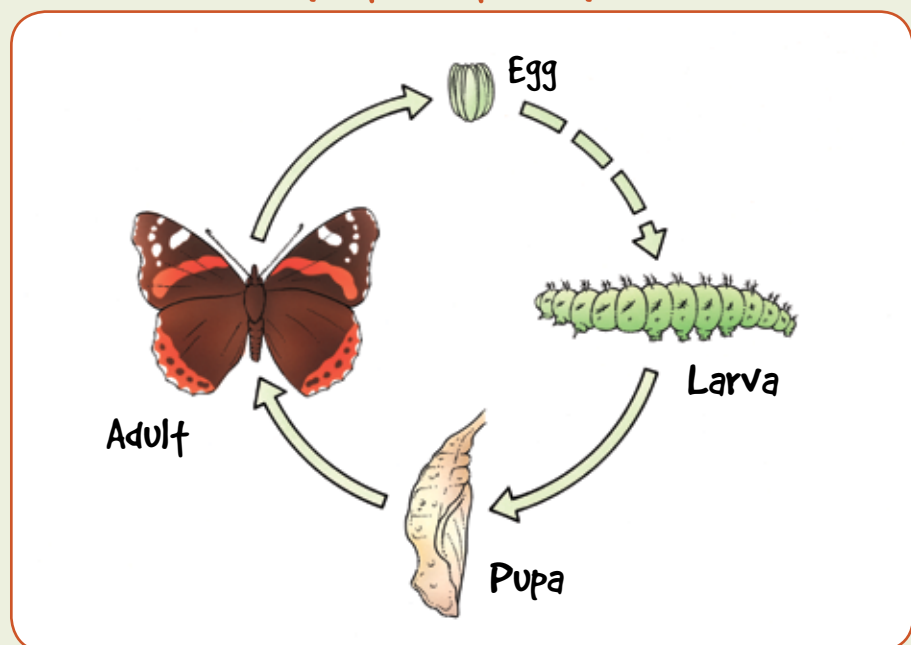
## Modifications/Extensions

Explore and analyze science problems of pest-related damage to trees in the school neighborhood. Take notes and make charts of students' observations in order to gain insight into the problem. Research solutions for the pest problem and select a remedy.

Visit a local nursery, orchard, or other agricultural production facility that utilizes integrated pest management.



## Complete Metamorphosis



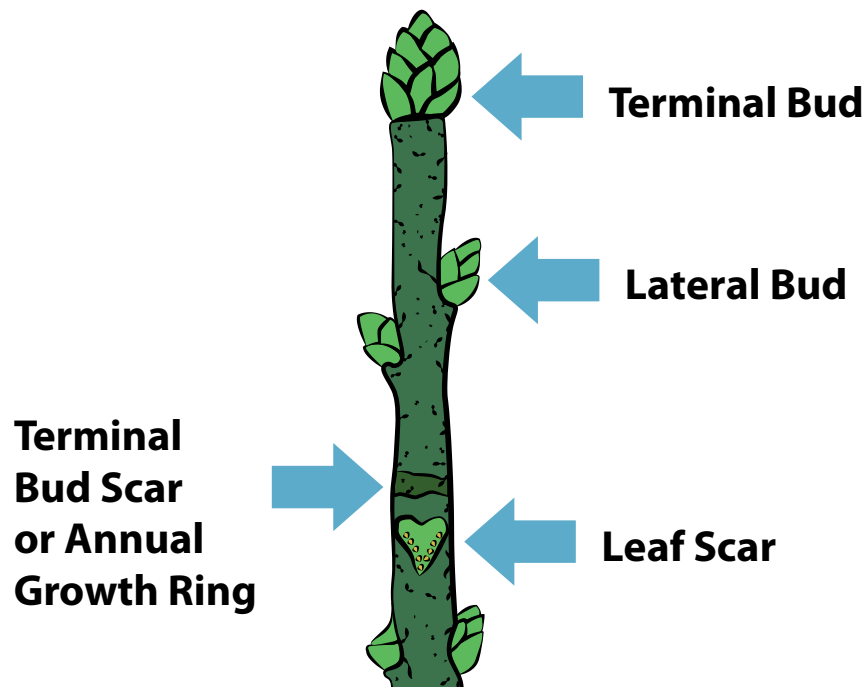
### Sources/Credits

Adapted from New York Agriculture in the Classroom and Cornell University's *Sciences of Life Explorations* (SOLE). See the full lesson plan at <http://www.agclassroom.org/ny/resources/pdf/activities/ipm.pdf>

# Twig Defective

## Parts of a Twig

- **pith** - center of a twig
- **leaf scar** - area where leaf was attached to the branch
- **bud** - oval-shaped structures usually found above leaf scars
- **terminal bud ring** - a scar that may form a ring around the twig, located where the prior year's terminal bud was



## Determining Twig Growth

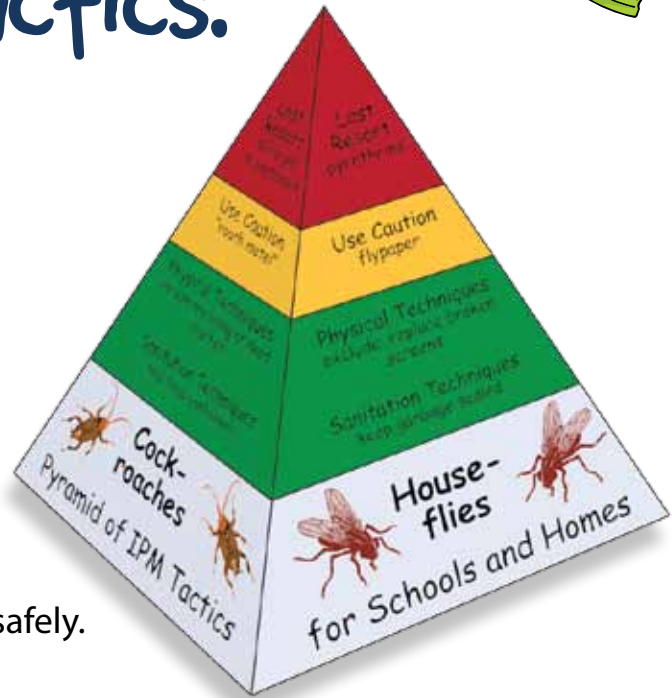
Measure the distance from one terminal bud ring to the next, or from last year's terminal bud ring to this year's terminal bud.



# Pyramid of IPM Tactics: Red, Yellow, Green

-  **Red:** "Stop; don't go!"
-  **Yellow:** "Be cautious"
-  **Green:** "Go safely!"

Just like traffic signals use red, yellow and green for our safety, the IPM Pyramid reminds us when and how to use pesticides safely.



Use the terms above to fill in the blanks.

## **Green: Sanitation and Physical Techniques**

When we look at the pyramid, the largest area is the bottom – this is the green area. When we are trying to rid our home of a pest, we can use the actions in the green zone safely. They are the methods we should try first and use often. For example, to reduce ants in the house, clean up crumbs from food. This is a very safe method of pest management and can be used by both children and adults. So, it is in the green area.

Green means "\_\_\_\_\_"

Examples of techniques in the green zone:

## **Yellow: Use Caution**

The next area is yellow. These methods can be used, but only by an adult and only with care.

Yellow means “\_\_\_\_\_”

Examples of techniques in the yellow zone:

## **Red: Last Resort**

Red is the smallest area of the pyramid and should be used the least often. These methods usually use a chemical to reduce the pest and may be harmful to others, especially if not used properly. These methods can only be used by an adult, and only when absolutely necessary.

Red means “\_\_\_\_\_”

Examples of techniques in the red zone:



# Integrated Pest Management Steps

If you think you have found a pest, what should you do? Be careful! Ask an adult to help you. Remind them to follow the IPM steps.

## Step 1. Learn to identify the pest properly.

Before you decide you need to get rid of a bug you saw on your plant, make sure you know if it's a pest or not. Some of the most ferocious "good" bugs are the larvae of ladybugs and lacewings. They eat many insect pests, so we call them beneficial insects. If you don't know what they look like, you might think they were "bad" bugs. When you spray, you destroy beneficial insects too. Think before you act!

## Step 2. Learn the life cycle and biology.

Because of the life cycle of pests, there is usually a time when your treatment will work best. If you treat at the wrong time, it may not work – it may be a waste of time and money. IPM means finding out the best way to treat a pest before you take action. Look for more information about your pest online, or contact a Cooperative Extension office in your area.

## Step 3. Sample and monitor the environment.

Sampling the environment means don't treat the pest until you are sure there are enough of them to be a problem. (It is important to know the pest's life cycle and biology.)



### Step 4. Determine an action threshold.

There are always going to be pests (like insects, diseases, and weeds) in and around your home and yard. If you have learned about the pest, you know when you can ignore it or when you should act to treat it. Remember, you should not use pesticides yourself. Only adults should use pesticides. They should only use them when they have read the label carefully and have decided it is necessary.

### Step 5. Choose actions.

The first actions (called tactics) you consider should be the safest ones. Always think of the IPM pyramid. Use tactics from the green zone first (Go Safely). For example, use a fly swatter instead of spraying, or pull young weeds by hand before they mature and drop seeds.

### Step 6. Evaluate results.

Keep track of what worked and what didn't work. If you always have problems with pests in the same place, at the same time every year, it is time to make changes. For example, your Mom's favorite shrub used to get a leaf spot disease every summer. Last year, you cleaned up and removed the dry leaves in the late fall (where the fungus spores were hiding). This year, the plant did not get spots. What does that mean? Will you clean up and remove the dry leaves every year to prevent infection?



# Integrated Pest Management

1. Some insects can be both a pest and beneficial.

☐ Yes

☐ No

2. What color is the largest part of the IPM Pyramid?

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3. What color is the smallest part of the IPM Pyramid? Why?

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4. Many chemicals can be found in your home. They may be under your kitchen sink or in the garage. Does that mean you can use them?

☐ Yes

☐ No